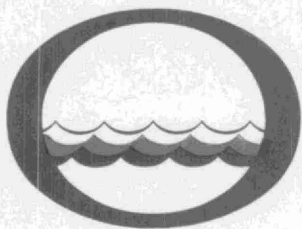


BBOL

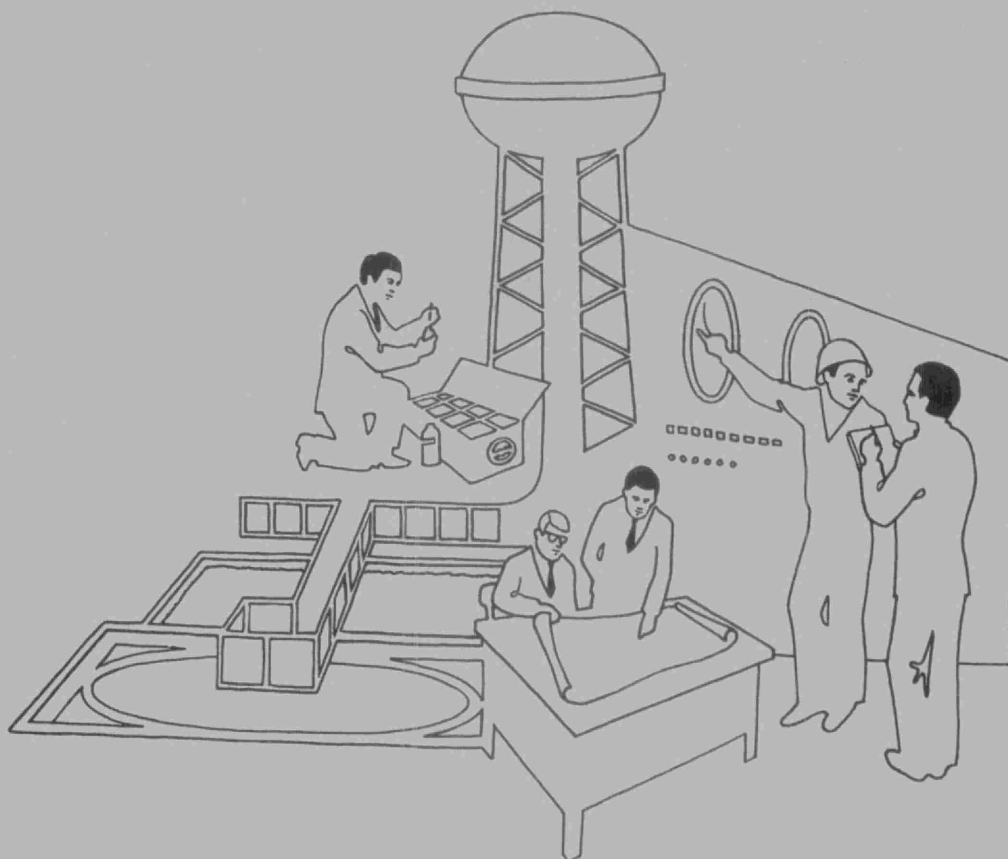


Water management in Ontario

Ontario
Water Resources
Commission

Detroit
District
Engineers
Branch

Detroit



WATER POLLUTION SURVEY

(GRAND MARAIS DRAIN & LENNON DRAIN)

CITY OF WINDSOR

COUNTY OF ESSEX

JULY, SEPTEMBER, OCTOBER, 1971

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca

BBOL

REPORT

on the

WATER POLLUTION SURVEY

of the

GRAND MARAIS DRAIN

LENNON DRAIN

CITY OF WINDSOR

COUNTY OF ESSEX

July, September, October, 1971

DISTRICT ENGINEERS BRANCH
DIVISION OF SANITARY ENGINEERING

Prepared by: C.W. Brink, P. Eng.

CITY OF WINDSOR
REPORT ON A WATER POLLUTION SURVEY
OF THE
GRAND MARAIS DRAIN AND LENNON DRAIN

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SUMMARY AND RECOMMENDATIONS	2
KEY MAP	7
GENERAL	8
SURVEY PROCEDURES AND PRESENTATION OF RESULTS	10
WEATHER	12
DESCRIPTION OF AREAS SURVEYED	14
I Grand Marais Drain Survey	
II Lennon Drain Survey	
DISCUSSION OF SURVEY RESULTS	16
1 Grand Marais Drain Survey	16
I.A.: Area "A" (Mark Avenue Area)	16
I.B.: Area "B" (Dominion-Dougall Area)	19
I.C.: Area "C" (Howard-Parent Area)	22
I.D.: Area "D" (Alexis-Grand Marais Area)	26
II Lennon Drain Survey	29

APPENDIX I: Significance of Laboratory Results,
Abbreviations and Symbols

APPENDIX II: Grand Marais Drain - Survey Results

APPENDIX III: Lennon Drain - Survey Results

APPENDIX IV: Grand Marais Drain - Pictorial Survey

APPENDIX V: Lennon Drain - Pictorial Survey

ONTARIO WATER RESOURCES COMMISSION

REPORT

INTRODUCTION

For the past five years the City of Windsor has been proceeding with a staged programme of sewage treatment plant and trunk sewer construction. This has resulted in the completion of the West Windsor Sewage Treatment Plant in 1970, the construction of the Riverfront Interceptor Sewer in 1969-70 and the construction of the Western Main Trunk and parts of the Grand Marais Trunk and Lennon Trunk to date. At the present time the Grand Marais Trunk Sanitary Sewer and the Lennon Trunk Sanitary Sewer have reached the Mark Avenue Sewage Treatment Plant and the Avon Drive Sewage Treatment Plant respectively. The OWRC and the City have been reviewing, on an annual basis, the priorities and staging of this sewer. The purpose of this report is to provide the Commission and the City of Windsor with a first-hand picture of the pollution conditions in the Grand Marais drainage area in order that a realistic evaluation of the situation can be made and the priorities can be put in the proper perspective for on-coming years.

SUMMARY AND RECOMMENDATIONS

The purpose of this report is to assist the Ontario Water Resources Commission and the City of Windsor in establishing priorities for the city's sewer construction programme.

The survey of the Grand Marais Drain and Lennon Drain was conducted in dry-weather conditions. A total of eighty-five storm-sewer outfalls were examined and field observations recorded. Forty-nine storm-sewer outfalls were actually sampled. The samples obtained were analysed for the common water pollution indicators.

It was observed that the volume of domestic and industrial wastes constituted, at the time of the survey, a major portion of the flow in the Grand Marais Drain and Lennon Drain.

The report concludes that polluting materials from domestic and industrial sources are being discharged at numerous locations in considerable quantities via storm sewers into the Grand Marais Drain and Lennon Drain.

The majority of storm sewers, which conveyed inadequately treated wastes from malfunctioning septic tank systems to the Grand Marais Drain, are situated in the residential and commercial area bounded on the west by Huron Church Road and on the east by Dougall Avenue. However, storm sewers conveying

insufficiently treated wastes were also found at other areas, such as at Parent Avenue and Alexis Road. It is assumed that the main source of pollutants flowing into the Lennon Drain is the Casgrain Drive storm sewer.

Considering the urgent necessity of improvements of the presently unsatisfactory conditions of both the Grand Marais Drain and Lennon Drain, the following recommendations are presented:

1. The City of Windsor should proceed immediately with the construction of the local sanitary sewers on Mark Avenue, McKay Avenue, Dominion Boulevard and other streets as proposed in the 1972 Local Improvement Programme with a total estimated cost of \$641,000 as the first phase of necessary improvements in the area between Mark Avenue and South Cameron Boulevard.
2. The City of Windsor should further proceed on a priority basis with the construction of sanitary collector sewers and local sanitary sewers for the residential and commercial area between Mark Ave. and South Cameron Boulevard as contained in the report on "Local Sanitary Sewers for South Windsor Area" (Department of Public Works, City of Windsor) to eliminate as soon as possible the serious pollu-

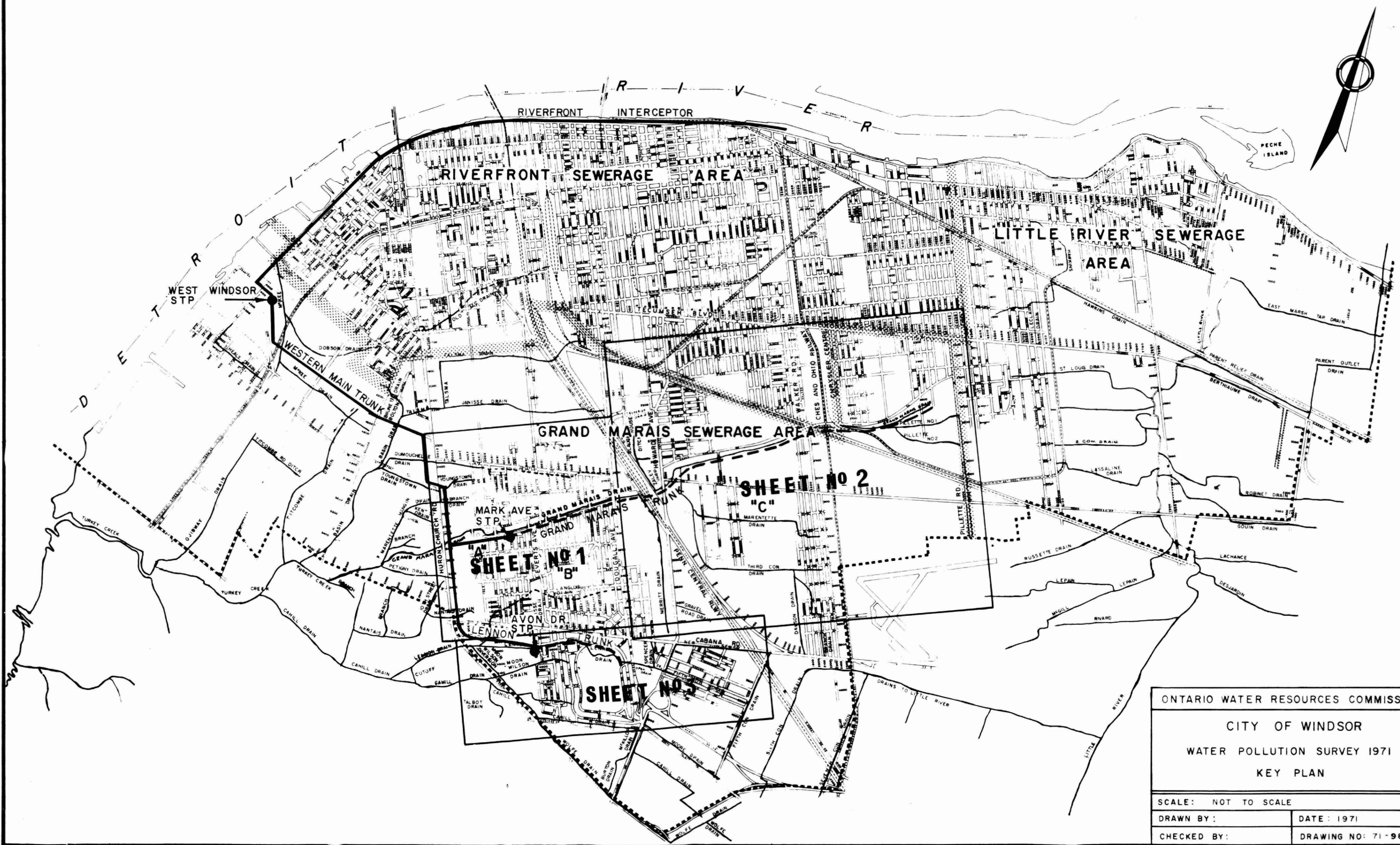
tion emanating from this area. The provision of sanitary sewers in this area is urgently needed and demonstrated by the fact that approximately 35 storm-sewer outfalls convey inadequately treated domestic wastes from malfunctioning septic tanks into the Grand Marais Drain at an estimated dry-weather flow of 1,500,000 to 2,000,000 gallons per day.

3. Local sanitary sewers on those streets in the residential area between Huron Church Road and Mark Avenue, which due to the lack of sanitary sewers, discharge domestic wastes from malfunctioning septic tanks via storm sewers into the Grand Marais Drain are required as soon as possible.
4. The Lennon Trunk Sanitary Sewer should be extended eastwards up to Casgrain Drive and local sanitary sewers are required for the residential area east of Longfellow Avenue, south of Cabana Road, north of Cousineau Road and west of Highway No. 3B (Dougall Avenue) to eliminate the discharge of inadequately treated domestic wastes from the storm sewers in this area to the Lennon Drain.

5. Until the Grand Marais Trunk Sanitary Sewer has been completed up to Parent Avenue, the possibility of trucking the wastes originating from the Devon Industrial Park to one of the city's sewage treatment plants as an interim solution should be carefully explored. If trucking of the wastes is not feasible, these wastes should be heavily chlorinated prior to discharge into the Grand Marais Drain, and effective control on the chlorination efficiency should be maintained at all times.
6. Sanitary sewers for the developed parts of the residential and commercial area bounded on the west by Penn Central Railway and on the east by Walker Road are required to eliminate the discharge of inadequately treated domestic wastes via storm sewers into the Grand Marais Drain.
7. The Grand Marais Trunk Sanitary Sewer should be extended eastwards from Parent Avenue to Alexis Road and local sanitary sewers should be provided for the residential area now serviced by malfunctioning septic tanks and a storm-sewer system draining to the Alexis-Grand Marais Pumping Station. This is required to alleviate the pollution problems

created by the residential development in this area.

8. Until sanitary sewers are provided in this area, the inadequately treated domestic wastes conveyed by the storm-sewer system of the residential area, bounded on the west by Chrysler Centre, on the north by Tecumseh Boulevard, and on the east by Pillette Road and on the south by Grand Marais Road, to the Alexis-Grand Marais Pumping Station, should be immediately chlorinated prior to being pumped into the Grand Marais Drain.
9. Sanitary sewers are required for the residential area east of Howard Avenue, south of Cabana Road, north of Wallace Street and west of the Sixth Conc. Road, since domestic wastes from this residential area gain access to the Lennon Drain.
10. The Airport storm sewer and the E.C. Row roadside ditch should be checked to establish if pollutants are being conveyed to the Grand Marais Drain by these routes and any necessary corrective measures should be taken.
11. The municipality should submit to the Ontario Water Resources Commission an acceptable programme for the elimination of the pollution problems noted in this report.



ONTARIO WATER RESOURCES COMMISSION	
CITY OF WINDSOR	
WATER POLLUTION SURVEY 1971	
KEY PLAN	
SCALE: NOT TO SCALE	
DRAWN BY:	DATE: 1971
CHECKED BY:	DRAWING NO: 71-98-DE

GENERAL

In 1970 the City of Windsor placed into operation the newly constructed West Windsor Sewage Treatment Plant. This primary treatment plant, with a design capacity of 24 mgd, has been designed to receive the wastes of both the lands tributary to the River-front Interceptor Sewer and the lands tributary to the Grand Marais Drain.

The River-front Interceptor Sewer has been completed and services roughly the area west from Pillette Road and north of Tecumseh Blvd., Canadian Pacific Railway, Totten Street and Chappel Avenue. (See Key Plan.) This sewer intercepts the dry-weather flow from the existing combined sewers.

The main features of the Grand Marais Sanitary Sewerage System are the Western Main Trunk Sanitary Sewer, the Grand Marais Trunk Sanitary Sewer and the Lennon Trunk Sanitary Sewer. The Western Main Trunk Sanitary Sewer commences at the inlet chamber of the West Windsor Sewage Treatment Plant and terminates slightly east of Huron Church Road at the Grand Marais Drain. This trunk has already been completed. It will, therefore, be possible to eliminate, in the very near future, the existing Ambassador Pumping Station and presently-overloaded industrial lagoon facilities.

The Grand Marais Trunk Sanitary Sewer commences at the terminus of the Western Main Trunk Sanitary Sewer and proceeds

easterly following closely the existing Grand Marais Drain. Ultimately its subtrunks will reach as far east as Pillette Road. The first section of this trunk has been completed up to the Mark Avenue Sewage Treatment Plant, and the domestic wastes previously treated at this overloaded plant are now directed via this trunk to the West Windsor Plant for treatment. Funds have been proposed in the year 1972 for the extension of the trunk sanitary sewer from Mark Avenue Sewage Treatment Plant eastwards to Parent Ave. The city envisages in Stage II of their Trunk Sewer Programme, extending the Grand Marais Trunk Sanitary Sewer eastwards from Parent Avenue.

The Lennon Trunk Sanitary Sewer also commences at the terminus of the Western Main Trunk Sanitary Sewer. This trunk sewer is routed first southerly parallel to Huron Church Road to 500 feet south of Cabana Road. There it turns eastwards and proceeds along Kennedy Drive. This trunk sewer has been completed up to the Avon Drive Sewage Treatment Plant. The domestic wastes of the built-up area, serviced by this treatment plant, and the wastes originating from the St. Clair College of Applied Arts and Science are now directed to this trunk sewer. The city plans in Stage II of their Trunk Sewer Programme to extend the Lennon Trunk Sanitary Sewer eastwards from the Avon Drive Sewage Treatment Plant. At present Stage II is not included in the Capital Works Programme for the ten-year period 1971-1980 of the City of Windsor.

SURVEY PROCEDURES AND PRESENTATION OF RESULTS

The intent of this survey was to determine in general the extent of pollutants, if any, conveyed by storm sewers to the Grand Marais Drain and Lennon Drain.

During the survey the size of outfalls was measured, where possible, for future reference. Other field observations, such as the odour of sewage or the occurrence of black deposits at the foot of the outfall, were noted. Black deposits are common where untreated domestic wastes are discharged to watercourses.

The water-depth in the storm sewers at the discharge point was measured and the volume of flow was estimated, where possible.

Grab samples were taken at numerous storm-sewer outfalls at the point where they discharge into the watercourse. In addition, samples were taken at several locations along the route of the Grand Marais Drain and Lennon Drain. The samples were analysed for common water pollution indicators, namely, biological oxygen demand (BOD₅), suspended solids, Kjeldahl nitrogen, total phosphorus, anionic detergents, faecal and total coliform counts per 100 ml.

The field observations for all stations, the chemical analyses and bacteriological examination results for those stations actually sampled have been summarized and are provided in Appendices II and III. In both cases the description of the

sampling points follows closely the direction of flow of the watercourses in question.

At various locations, photographs have been taken to illustrate the effects and the magnitude of the domestic wastes discharged to these drains. These photographs are contained in Appendices IV and V.

WEATHER

The pollution survey was conducted during dry weather. Rainfall data from the two weather stations at Windsor for August and September are presented below. This information was made available by the Atmospheric Environment Services, Climatology Division, Environment Canada.

<u>WINDSOR UNIVERSITY</u>			<u>WINDSOR AIRPORT</u>		
		Precipitation			Precipitation
<u>Month/Day</u>		<u>in Inches</u>	<u>Month/Day</u>		<u>in Inches</u>
August	10	.61	August	10	1.73
"	19	.04	"	19	.03
"	20	.05	"	21	.02
"	22	.07	"	22	.03
"	26	2.52	"	25	.01
"	27	.03	"	26	1.38
Sept.	4	.05	Sept.	27	.25
"	5	.10	"	4	.18
"	6	.09	"	6	.29
"	15	.02	"	10	.03
"	19	.38	"	16	.03
"	20	.62	"	20	1.03
"	25	.19	"	25	.07
"	26	.85	"	26	.12
"	27	.18	"	27	.88
Total August		3.32	Total August		3.45
Total Sept.		2.48	Total Sept.		2.63

From perusal of the above rainfall data and actual field observations it was concluded that only a small portion of the flow reaching the Grand Marais Drain and Lennon Drain at the time of the survey could be attributed to natural drainage. This was particularly substantiated by comparing observations made in developed areas where sanitary sewers and storm sewers were available, with

observations from developed areas where only storm sewers were provided. The storm sewers in the sanitary sewered areas had no visible flow or very little flow, whereas the storm sewers in the "septic tank" areas very often had a substantial flow. It is concluded, therefore, that a major portion of the flow in the Grand Marais Drain and Lennon Drain are from domestic and industrial wastes' discharges.

DESCRIPTION OF AREAS SURVEYEDI Grand Marais Drain Survey

One can divide the areas lying east of Huron Church Road and draining to the Grand Marais Drain basically into four groups (See Key Plan).

Area "A" (Mark Avenue)

Area "A" consists of the residential area east of Huron Church Road, north of Cabana Road, south of E.C. Row and west of Everts Avenue and Mark Avenue. Randolph Avenue extends for approximately 1,500 feet north of E.C. Row.

Area "B" (Dominion Blvd. - Dougall Avenue)

This area is bounded on the east by the Penn Central Railway, on the south by Cabana Road, on the north by E.C. Row, and on the west by Everts Avenue and Mark Avenue. Some streets, belonging to this drainage area, extend north of E.C. Row. This area is for the larger part developed with single-family residences. Several shopping centres, motels and restaurants are also located in this area, in particular along Dougall Avenue.

Area "C" (Howard Avenue - Parent Avenue)

This area lies east of the Penn Central Railway and west of the Chesapeake and Ohio Railway. The main features of this area are the commercial enterprises along Howard

Avenue, the Devonshire Shopping Mall and the Devon Industrial Park.

Area "D" (Alexis Road - Grand Marais)

This most eastern area is bounded by Cheseapeake and Ohio Railway, Tecumseh Blvd., Pillette Road, and Grand Marais Road. The key points of this area are the Alexis-Grand Marais Pumping Station and the Chrysler Waste Treatment Plant.

II Lennon Drain Survey

The survey of the Lennon Drain covered the developed areas bounded on the west by Highway No. 3 (city limits), on the north by Cabana Road, on the east by the Sixth Concession Road and on the south by Cousineau Road and Wallace Street. The Avon Drive Sewage Treatment Plant and the St. Clair College for Arts and Applied Science are located in this area.

DISCUSSION OF SURVEY RESULTSI Grand Marais Drain SurveyI.A.: Area "A" (See Map, Sheet 1)

This residential area bounded by Huron Church Road, Cabana Road, E.C. Row Road, Everts Avenue and Mark Avenue, is predominantly serviced by both sanitary sewers and storm sewers. The domestic wastes were conveyed to the Mark Avenue Sewage Treatment Plant until late November, 1971. For some time this treatment plant has been hydraulically overloaded and as a result the effluent discharged to the Grand Marais Drain was of unsatisfactory quality (GM-0-37; BOD₅: 75 ppm). However, the wastes are now directed via the Grand Marais Trunk Sanitary Sewer to the West Windsor Plant for treatment.

Although many streets in this residential area have both sanitary and storm sewers, there are several streets which have only storm sewers. The storm sewers of these streets obviously conveyed high-strength domestic wastes from malfunctioning septic tanks to the Grand Marais Drain. Since the Grand Marais Trunk Sanitary Sewer is already substantially completed up to Mark Avenue, these sources of pollution could be severed in the immediate future by the construction of local sanitary sewers. The sewer maps of the City of Windsor were perused to determine which outfall corresponds to a specific developed area and the following summary has been prepared for those

areas which, due to the lack of sanitary sewers, discharge domestic wastes via the storm sewers into the Grand Marais Drain.

Summary of Streets Which Lack Sanitary Sewers

1. South-side Grand Marais Drain

California Avenue (GM-0-45)

Observed: High-strength domestic wastes at storm-sewer outfall.
BOD₅: 280 ppm; total coliform: 23,000,000

Required: 1300 feet of local sanitary sewers.

Randolph Avenue

Observed: Domestic wastes at storm-sewer outfall.

Required: 700 feet of local sanitary sewers.

Rankin Avenue (GM-0-40 and outfall 250 feet east of Rankin Avenue)

Observed: Domestic wastes at storm-sewer outfall.
BOD₅: 44 ppm; total coliform: 8,000,000.

Required: 2,000 feet of local sanitary sewers.

Glenwood Avenue (GM-0-38)

Observed: High-strength domestic wastes at storm-sewer outfall.
BOD₅: 85 ppm; total coliform: 76,000

Required: 700 feet of local sanitary sewer.

2. North-side Grand Marais Drain

Askin Avenue (GM-0-43)

Observed: High-strength domestic wastes at storm-sewer outfall.
BOD₅: 120 ppm; total coliform: 10,000,000

Required: 3,000 feet of local sanitary sewers.

Randolph Avenue (GM-0-41 and Photo # 9)

Observed: High-strength domestic wastes at storm-sewer outfall.
BOD₅: 140 ppm; total coliform: 7,600,000

Required: 4,500 feet of local sanitary sewers.

Glenwood Avenue

Observed: Domestic wastes at storm-sewer outfall.

Required: 300 feet of local sanitary sewers on
Glenwood Avenue
600 feet of local sanitary sewers on
Grand Marais Road.

Now that the Grand Marais Trunk Sanitary Sewer has reached this area, these wastes can be prevented from reaching the Grand Marais Drain by the construction of local sanitary sewers. The City of Windsor should initiate the construction of these sewers immediately. The construction of these sanitary collector sewers and the redirection of the wastes, previously received at the Mark Avenue Sewage Treatment Plant, should eliminate the pollution discharged to the Grand Marais Drain from this area.

In addition to the above, the following two storm-sewer outfalls, at Massey Court (GM-0-39; faecal coliform 22,000) and at Everts Avenue (GM-0-36; BOD₅: 28 ppm; faecal coliform 240,000) both on the south-side of the Grand Marais Drain, should be checked to establish if improper connections to these storm sewers

have been made. The field observations and analyses results of samples collected during the survey do not indicate complete satisfactory conditions, although sanitary sewers are provided on these streets.

RECOMMENDATION - Area "A"

Local sanitary sewers on the above-mentioned streets, which due to the lack of sanitary sewers discharge domestic wastes from malfunctioning septic tanks via storm sewers into the Grand Marais Drain are required as soon as possible.

I.B.: Area "B" (See Map, Sheet 1)

Area "B", bounded by Penn Central Railway, Cabana Road, E.C. Row, Mark Avenue and Everts Avenue, has an estimated population of 12,000 people. Some of the commercial centres, such as the Yorktown Shopping Plaza, operate their own sewage disposal systems (GM-0-34; BOD₅: 4.2 ppm; faecal coliform: 230). Only approximately 20% of the homes have weeping-bed disposal systems along with the septic tanks. The remainder have either a direct connection from the septic tank to the storm sewer or are equipped with some form of gravel filter prior to connection to the storm

sewer. Of the 20% which have septic tanks and weeping beds virtually all are also equipped with an overflow drain to the storm sewers. Because of the poor soil conditions (heavy clay) many of these systems fail without the knowledge of the homeowner. The overflow drain directs the sewage to the storm sewer before ponding can occur in the backyard. The net result of all these systems is the discharge of large quantities of partially treated domestic wastes via municipal storm sewers to the Grand Marais Drain.

The chemical analyses and bacteriological examination results leave no doubt as to the source of these wastes. The presence of faecal coliforms, high phosphorus levels, BOD₅ and low suspended solids clearly indicate the presence of domestic wastes resulting from septic-tank overflows. See sampling point numbers GM-0-12 to GM-0-35 in Appendix II.

The combined dry-weather flow of the storm sewers in this area is estimated to amount to 1,000,000 to 2,000,000 gallons per day. An example of the dry-weather flow from the storm sewer outfalls at Dougall Avenue can be seen in Appendix IV, Photo #7 and Photo #8 (GM-0-13; BOD₅: 28 ppm; faecal coliform 270,000 and GM-0-14; BOD₅: 34 ppm; faecal coliform: 250,000).

High strength domestic wastes were detected at the storm sewer outfalls of Church Street (GM-0-15; BOD₅: 180 ppm; faecal coliform 1,460,000), Bruce Avenue (GM-0-17; BOD₅: 95 ppm; faecal

coliform 410,000), Avondale Court (GM-0-18; BOD₅: 120; faecal coliform: 910,000), Morris Drive (GM-0-27; BOD₅: 90 ppm; faecal coliform 160,000), and McKay Avenue (GM-0-33; BOD₅: 75 ppm; faecal coliform 110,000,000). Industrial wastes are suspected at the outfall opposite Virginia Park (GM-0-23; BOD₅: 750 ppm and milky appearance). The above clearly establishes that a very serious pollution problem indeed exists in this area and that corrective measures - i.e., local sanitary sewers - are urgently needed. Based on the status of the municipalities' programme to date, correction could be completed by the end of 1974.

It is noted that a report on "Local Sanitary Sewers for South Windsor Area" was recently prepared by the Department of Public Works of the City of Windsor. This report contains detailed information on how this area could be provided with sanitary sewers as economically as possible. The cost for the construction of the necessary sanitary collector sewers, local sanitary sewers together with connections to the property line, is estimated at approximately \$5,000,000.00. The city's Local Improvement Programme allots for 1972, an amount of \$641,000 for the construction of local sanitary sewers as the first phase of the city's improvement programme for this area.

RECOMMENDATION - Area "B"

1. The City of Windsor should proceed immediately with the construction of the local sanitary sewers as proposed in the 1972 Local Improvement Programme with a total estimated cost of \$641,000 as the first phase of necessary improvements in this area.
2. The City of Windsor should further proceed on a priority basis with the construction of sanitary collector sewers and local sanitary sewers as contained in the above-mentioned report to eliminate as soon as possible the serious pollution emanating from this area. The provision of sanitary sewers in this area is urgently needed and demonstrated by the fact that approximately 35 storm-sewer outfalls convey inadequately treated domestic wastes from malfunctioning septic tanks into the Grand Marais Drain at an estimated dry-weather flow of 1,500,000 to 2,000,000 gallons per day.

I.C.: Area "C" (See Map, Sheet 2)

The main features of Area "C" are the commercial enterprises along Howard Avenue and Walker Road, the Devon Industrial Park and the residential areas, which have an estimated population in excess of 8,000 people.

In the Devon Industrial Park, situated along Marentette Avenue and Devon Drive, sanitary sewers have been provided to collect the wastes originating from the industries. These wastes are directed to the Parent-Grand Marais Pumping Station where they are pumped into the Grand Marais Drain (GM-0-7). This pumping station is equipped with two pumps, each with a rated capacity of 450 US gpm. The daily flow from this pumping station is estimated to amount to 15,000 gallons per day. Field observations showed that the colour of these wastes changes regularly. This is probably caused by the wastes of the gelatine factory, situated in this industrial park. The analyses results (GM-0-7; BOD₅: 160 ppm; total coliform 36,000,000) revealed that a high-strength waste with extremely high total coliform count was being discharged. Photographs Nos. 4, 5 and 6 in Appendix IV illustrate the above findings.

It is understood that funds are proposed in the 1972 budget of the city for the construction of the Grand Marais Trunk Sanitary Sewer from Mark Avenue to Parent Avenue. If this schedule is adhered to, the wastes presently discharged from the Devon Park Industrial Park to the Grand Marais drain could be re-routed to this trunk late in 1973. However, in the interim the possibility of trucking these wastes to one of the city's sewage treatment plants, instead of dumping these high-strength wastes into the Grand Marais Drain should be carefully explored. If discharge

to the Grand Marais Drain is continued, these wastes should be heavily chlorinated and an effective control on these chlorination practices should be maintained at all times.

Domestic wastes from malfunctioning septic tanks were detected at the storm-sewer outfalls at Turner Road (GM-0-4; BOD₅: 34 ppm; total coliform 4,600,000), Byng Road (GM-0-5; BOD₅: 90 ppm; total coliform 40,000,000), Parent Avenue (GM-0-6; BOD₅: 160 ppm; total coliform 510,000,000) and Remington Avenue (GM-0-8; BOD₅: 120 ppm; total coliform: 30,000,000). The storm-sewer outfalls on Howard Avenue and Walker Road were inaccessible and no meaningful evaluation of their condition could be made.

The drainage ditch at E.C. Row appeared quite satisfactory. However, the phosphorus content of 3.0 ppm, the high-total coliform count, the growth of algae and the rather high dry-weather flow, all indicate that probably domestic wastes together with cooling water from industrial complexes are discharged to the Grand Marais Drain at this point (GM-0-9; BOD₅: 4.6 ppm; total coliform: 220,000). The same can be said for the Airport storm sewer, which outfalls 300 feet east of Walker Road. At the time of the survey an oil film was observed, which was probably caused by a heavy bunker oil. This storm sewer, as well as the E.C. Row roadside ditch, should be checked regularly to establish the importance of the above findings and to initiate

corrective measures, if necessary. (GM-0-3; BOD₅: 10 ppm; total coliform: 110,000).

Domestic wastes, originating from the Devon Shopping Mall, are directed via a pumping station and a forcemain along Parent Avenue to a combined sewer, which is situated in the south limits of the River-front sewerage area. The only outfall, which could be associated with the shopping mall, conveyed clear, warm water. Apparently cooling water from air conditioning units was directed to this outfall (GM-0-10; BOD₅: <0.5 ppm; total coliforms: <4).

RECOMMENDATIONS - Area "C"

1. Until the Grand Marais Trunk Sanitary Sewer has been completed up to Parent Avenue, the possibility of trucking the wastes originating from the Devon Industrial Park to one of the city's sewage treatment plants as an interim solution should be carefully explored. If trucking of the wastes is not feasible, these wastes should be heavily chlorinated prior to discharge into the Grand Marais Drain, and effective control on the chlorination efficiency should be maintained at all times.
2. Sanitary sewers for the developed parts of this area are required to eliminate the discharge of inadequately

treated domestic wastes via storm sewers into the Grand Marais Drain.

3. The Airport storm sewer and the E.C. Row roadside ditch should be checked to establish if pollutants are being conveyed to the Grand Marais Drain by these routes and any necessary corrective measures should be taken.

I.D.: Area "D" (See Map, Sheet 2)

The residential area, bounded on the west by Chrysler Centre, on the north by Tecumseh Blvd., on the east by Pillette Road and on the south by the Grand Marais Road, is serviced by storm sewers and septic-tank systems. All storm sewers in this residential area drain to the Alexis-Grand Marais Pumping Station. This pumping station is located immediately south of the junction of Alexis Road and Grand Marais Road and is equipped with two storm water-pumps, each with a rated capacity of 18,000 U.S. gpm.

For the same reasons as outlined in Area "B" (namely, failing septic-tank systems, poor soil conditions and samples' results), it was obvious that inadequately treated domestic wastes were reaching the storm sewers and the Grand Marais Drain by means of the Alexis-Grand Marais Pumping Station (GM-0-1; BOD₅: 34 ppm; total coliform: 6,000,000). A strong odour of sewage was prevalent in the area surrounding the pumping station outfall. The dry-weather flow from this storm sewered area is

estimated to be at least 200,000 gallons per day. (See Photo #2, Appendix IV.) Since the domestic wastes of a large residential area are concentrated at one outfall, the provision of chlorination prior to discharge would be feasible and is therefore recommended immediately to minimize the continuation of a hazardous health situation.

A tremendous change in the stream characteristics of the Grand Marais Drain was observed between Meldrum Road and Alexis Road. (See Photos Nos. 1, 2 and 3, Appendix IV.) The Grand Marais Drain at Meldrum Road was a small watercourse with no visible flow and insufficient depth to take samples (See Photo #1, Appendix IV), but just west of the Alexis-Grand Marais Pumping Station, the Grand Marais Drain had the appearance of an open sewer (See Photo No. 3, Appendix IV). The chemical analyses and bacteriological examination results revealed that the level of pollution was high and directly caused by the discharge of domestic wastes at the Alexis-Grand Marais Pumping Station (GM-0-1 and GM-1; BOD₅: 34 ppm and 28 ppm respectively; total coliforms: 6,000,000 and 2,500,000 respectively). It is therefore recommended that the possibilities of extending the Grand Marais Trunk Sanitary Sewer eastwards to this area, and providing local sanitary sewers as early as possible, should be carefully reviewed.

The Chrysler Canada Ltd. has installed facilities to batch-treat all wastes derived from its operation as the company's efforts in water pollution abatement. Sludges, resulting from the treatment processes, are burned in an on-site incinerator. The treated effluent is discharged to the Grand Marais Drain. (GM-0-2; BOD₅: 32 ppm; suspended solids: 40 ppm; total coliform: 300). It is understood that the company is continuing to improve the reliability and performance of its treatment system. In this regard the Chrysler Canada Ltd. should investigate the possibilities of reducing the levels of BOD₅ and suspended solids in the treated effluent. This matter will be followed up by the Division of Industrial Wastes of the Ontario Water Resources Commission.

RECOMMENDATION - Area "D"

1. The Grand Marais Trunk Sanitary Sewer should be extended eastwards from Parent Avenue to Alexis Road and local sanitary sewers should be provided for the residential area now serviced by septic tanks and a storm-sewer system draining to the Alexis Grand Marais Pumping Station. This is required to alleviate the pollution problems created by the residential development in this area.
2. Until sanitary sewers are provided in this area, the inadequately treated domestic wastes conveyed by the storm-sewer system of the residential area, bounded

on the west by Chrysler Centre, on the north by Tecumseh Boulevard, on the east by Pillette Road and on the south by Grand Marais Road, to the Alexis-Grand Marais Pumping Station, should be immediately chlorinated prior to being pumped into the Grand Marais Drain.

II LENNON DRAIN SURVEY (See Map, Sheet No. 3)

The Lennon Trunk Sanitary Sewer, which will ultimately convey the domestic wastes, until now discharged into the Lennon Drain without appropriate prior treatment, has been substantially completed up to the Avon Drive Sewage Treatment Plant. The domestic wastes of the built-up area west of Longfellow Avenue which until the last week of October 1971 received treatment at the above-noted sewage treatment plant (LD-0-4), and the wastes of the St. Clair College of Applied Arts and Science are already directed to this trunk sewer.

The storm-sewer outfalls at Mount Royal Boulevard and at Carmel Drive appeared satisfactory (LD-0-3; faecal coliform 110). At Longfellow Avenue no observations could be made. All the above streets have both sanitary and storm sewers. The storm-sewer outfalls at Casgrain Drive (LD-0-1; BOD₅: 65 ppm; faecal coliform: 320,000) and at 200 feet west of Casgrain Drive, however, were both unsatisfactory. The only explanation for this phenomenon is that inadequately treated domestic wastes gain

access to the storm sewers via the overflow drains of the septic-tank systems. Photographs taken from the bridge at Casgrain Dr. show clearly how the appearance of a watercourse can change significantly by an input of raw sewage. Immediately upstream from the Casgrain Drive storm-sewer outfall the Lennon Drain looked clear, although a faecal coliform count of 37,000 indicates that some domestic wastes are discharged to the Lennon Drain upstream from this location (LD-2). Immediately downstream from the Casgrain Drive storm sewer (LD-0-1) a heavy growth of sewage fungi could be noticed. (See Photos Nos. 1 and 2 in Appendix V).

Although the construction of the Lennon Trunk Sanitary Sewer eastwards along Kennedy Drive is not considered by the City of Windsor within the next ten years, it is felt that a solution at an earlier date is necessary to prevent the discharge of domestic wastes from the storm-sewer outfalls at Casgrain Dr. and 200 feet west of Casgrain Drive since these storm sewers service a rather large residential area, namely, the area east of Longfellow Avenue, north of Cousineau Drive, west of Highway No. 3B (Dougall Avenue) and south of Cabana Road. It is recommended that the Lennon Trunk Sanitary Sewer be extended eastwards to Casgrain Drive and that local sanitary sewers be provided for the above-described residential area. The above, together with the elimination of the Avon Drive Sewage Treatment Plant, should

significantly reduce the amount of pollutants discharged into the Lennon Drain.

Another area which contributes to the pollution of the Lennon Drain is the residential area east of Howard Avenue, south of Cabana Road, north of Wallace Street and west of the Sixth Concession Road. The Lennon Drain passes through this area as a covered drain. Domestic wastes from septic-tank overflow drains gain access to the Lennon Drain via the tile road drains of this area (LD-1; BOD₅: 10 ppm; faecal coliform: 40,000). A total phosphorus concentration of 7.0 ppm and an ABS content of 2.9 ppm were noted. It is therefore apparent that sanitary sewers are also required for this area.

RECOMMENDATIONS - LENNON SEWERAGE AREA

1. The Lennon Trunk Sanitary Sewer should be extended eastwards up to Casgrain Drive and local sanitary sewers are required for the residential area east of Longfellow Avenue, south of Cabana Road, north of Cousineau Road and west of Highway No. 3B (Dougall Avenue) to eliminate the discharge of inadequately treated domestic wastes from the storm sewers in this area to the Lennon Drain.
2. Sanitary sewers should be provided for the residential area east of Howard Avenue, south of

Cabana Road, north of Wallace Street and west of the Sixth Concession Road since domestic wastes from this residential area gain access to the Lennon Drain.

APPENDIX I

CITY OF WINDSOR

WATER POLLUTION SURVEY

APPENDIX I

SIGNIFICANCE OF LABORATORY RESULTS, ABBREVIATIONS AND SYMBOLS

All the laboratory tests included in this report were performed at the Ontario Water Resources Commission laboratories in London and Toronto.

A. Bacteriological Examination

TOTAL COLIFORM organisms include a wide variety of bacteria ranging from the genus (group) *Escherichia Coli*, which originate mainly in the intestines of man and other warm blooded animals, to the genera *Citrobacter* and *Enterobacter aerogenes*. The latter genera are basically found in soil but are also present in faeces in small numbers. The presence of total coliforms in water may indicate soil run-off or, more important, less recent faecal pollution since organisms of the *Enterobacter-Citrobacter* groups tend to survive longer in water than do members of the *Escherichia Coli* group, and even to multiply when suitable environmental conditions exist.

The FAECAL COLIFORM organisms are those coliform bacteria which are of intestinal origin and, therefore, are an indicator of recent faecal pollution.

Most of the coliform bacteria found by the faecal coliform test are of the genus *Escherichia Coli*.

The results of the examinations are reported as "MF Coliform Count per 100 ml."

The Commission's objective for discharges to any water-course is a coliform density of not greater than 2,400 per 100 ml as determined by Standard Methods.

The OWRC Guidelines and Criteria for Water Quality Management in Ontario (1970) indicate that water used for total body contact recreation can be considered impaired when the total coliform, faecal coliform, and/or faecal streptococcus geometric mean density exceeds 1,000, 100, and/or 20 per 100 ml, respectively.

NOTE: The term "geometric mean" refers to a type of average. Mathematically speaking, the geometric mean of a set of N numbers is the Nth root of the product of the numbers; in practice, it is computed by the use of logarithms.

B. Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand is reported in parts per million (ppm), and is an indication of the amount of oxygen required for the stabilization of decomposable organic matter in the water. The completion of the laboratory test requires five days under the controlled incubation temperature of 20° C.

The Commission's objective for stream water quality is an upper limit of four (4) ppm.

Solids

The value for solids, expressed in parts per million, is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses with regard to surface water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, decomposition in streams, and injury to the habitat of fish.

Total Kjeldahl Nitrogen

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl, less the ammonia nitrogen, measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Phosphorus

Phosphorus is a major element of municipal sewage as a result of the utilization of synthetic detergents. To a certain extent, phosphorus is a highly desirable element

in maintaining a proper balance between plant and animal life in water. However, excessive and prolonged discharges will upset this balance and create an over-abundance of algae, weeds and nuisance organisms. Excessive growths of algae have been found developing in lakes when the average concentration of inorganic phosphorus was over 0.01 ppm.

Anionic Detergents as ABS

The Alkyl Benzene Sulfonate portion of the anionic detergents is reported in ppm. The test is generally employed to indicate the presence of illegal discharge of waste water to storm drains.

C. Abbreviations and Symbols

BOD	- Biological Oxygen Demand
Susp. Solids	- Suspended Solids
Total Kjeldahl	- Total Kjeldahl Nitrogen
ABS	- Alkyl Benzene Sulfonate
MF	- Membrane Filter
Ch	- 32-ounce sample taken, and submitted for chemical analyses
Ba	- 6-ounce sample taken, and submitted for bacteriological examination
ml	- Millilitre
mgd	- Million gallons per day
gpd	- gallons per day
gpm	- gallons per minute
<	- less than
>	- more than

APPENDIX II

CITY OF WINDSOR

WATER POLLUTION SURVEY

GRAND MARAIS DRAIN

SURVEY RESULTS

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: I A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
-	Pillette No.2 at Tourangeau Road	-	-	Dry	-	-	Sept.30/71 9:10 AM	Sunny Dry
-	Pillette No.1 at Tourangeau Road	-	-	West: dry East: ponded water	-	-	9:15 AM	"
-	Gr. Marais Drain at Tourangeau Road	-	-	Dry	-	-	9:20 AM	"
-	Gr. Marais Drain at Meldrum Road	-	-	No visible flow	Insufficient water depth for sampling	Photo #1	9:40 AM	"
GM-0-1	Alexis Pumping Stn Outfall - Northside Gr. Marais	30"	Pump cycle Off: 9:55 On: 10:43 Off: 10:44	200,000 gpd	Sanitary sewage smell; murky; foaming	Photo #2 Ch/Ba	10:45 AM	"
GM-1	Gr. Marais Drain at Bridge 200' west of Alexis Road	-	-	-	Sanitary sewage smell	Photo #3 Ch/Ba	10:10 AM	"
-	Storm sewer at Chrysler Centre Northside Gr. Marais	27"	Free flowing outfall	Trickle	Front section broken	-	10:55 AM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: I B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
-	Pillette No. 2 at Tourangeau Rd.	-	-	-	-	-	-	-
-	Pillette No. 1 at Tourangeau Rd.	-	-	-	-	-	-	-
-	Gr. Marais Drain at Tourangeau Rd.	-	-	-	-	-	-	-
-	Gr. Marais Drain at Meldrum Rd.	-	-	-	-	-	-	-
GM-0-1	Alexis Pumping Station outfall,north side Gr. Marais Drain	34	15	18	4.5	2.2	-	6,000,000
GM-1	Gr. Marais Drain at Bridge, 200' west of Alexis Rd.	28	15	19	4.6	< 0.5	-	2,500,000
-	Storm sewer at Chrysler Centre,north side Gr. Marais	-	-	-	-	-	-	-

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: II A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
GM-2	Gr. Marais Drain east of Chrysler waste influent sewer	-	-	-	Chrysler waste influent sewer appears to obstruct flow in Gr. Marais Drain	Ch/Ba	Sept.30/71 11:25 AM	Sunny Dry
-	Storm sewer at Chrysler Waste Treatment Plant - Northside Gr. Marais	50"	Partly submerged outfall	No visible flow	-	-	11:10 AM	Sunny Dry
GM-0-2	Chrysler Waste Treatment Plant Effluent		Free flowing open drain	1.8 mgd	Clear; some floating particles; extensive foaming	Ch/Ba	11:35 AM	"
GM-0-3	Airport storm sewer 300' east of Walker Road	21"	Partly submerged outfall	1-2 gpm	Oil on water surface No smell	Ch/Ba	11:55 AM	"
-	Storm sewers at Walker Road. Southside Gr. Marais	36" 27"	Partly submerged outfalls	No visible flow	No smell Inaccessible	-	12:15 PM	"
GM-0-4	Storm sewer at Turner Road Southside Gr. Marais	12"	Free flowing outfall	½ gpm	Light foaming; smell of sanitary sewage	Ch/Ba	12:25 PM	"
GM-3	Gr. Marais Drain 50' east of Byng Rd.	-	-	-	-	Ch/Ba	12:50 PM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: II B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
GM-2	Gr. Marais Drain east of Chrysler waste influent sewer	32	35	9.0	2.5	1.4	-	2,300,000
-	Storm sewer at Chrysler Waste Treatment Plant, north side Gr. Marais	-	-	-	-	-	-	-
GM-0-2	Chrysler Waste Treatment Plant Effluent	32	40	1.5	1.0	< 0.5	-	300
GM-0-3	Airport storm sewer, 300 ft. east of Walker Road	10	15	2.8	0.42	< 0.5	-	110,000
-	Storm sewers at Walker Road, south side Gr. Marais Dr.	-	-	-	-	-	-	-
GM-0-4	Storm sewer at Turner Road, south side Gr. Marais Dr.	34	40	18	10	9.0	-	4,600,000
GM-3	Gr. Marais Dr., 50' east of Byng Rd.	34	30	1.5	0.50	< 0.5	-	440,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET:III A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
GM-0-5	Storm sewer at Byng Road. Southside Gr. Marais Drain	21"	Free flowing outfall	¼" depth (2 gpm)	Smell of Sanitary sewage; murky; black deposits	Ch/Ba	Sept.30/71 12:55 PM	Sunny Dry
GM-4	Gr. Marais Drain at Langlois Ave.	-	-	-	-	Ch/Ba	2:05 PM	"
GM-0-6	Storm sewer at Parent Ave, northside Gr. Marais Drain	24"	Free flowing outfall	1" depth (4 gpm)	Smell of sanitary sewage; murky; black deposits	Ch/Ba	July 9/71 5:00 PM Sept.30/71 3:00 PM	"
GM-0-7	Devon Industrial Pk; Parent - Gr. Marais Pumping Station. Southside Gr. Marais Dr., 400' west of Langlois Ave.	6"	Free flowing outfall	Pump Cycle On: 2.21) Off: 2.22) On: 2.38) Off: 2.39) On: 3.09) Off: 3.10) - - - 15,000 gpd	Light green Pink; hot Light green Extensive foaming - - - Colourless Extensive foaming	Ch/Ba Heavy metals - - Ch/Ba	Photo #4 Photo #5 Photo #6 - - - July 9/71 5.00 PM	"
GM-0-8	Storm sewer at Remington Ave. Northside Gr. Marais Dr.	27"	Free flowing outfall	2" depth (10 gpm)	Smell of sanitary sewage; murky	Ch/Ba	Sept.30/71 3.20 PM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: III B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
GM-0-5	Storm sewer at Byng Rd., south side Gr. Marais Dr.	90	30	40	10	15	-	40,000,000
GM-4	Gr. Marais Drain at Langlois Ave.	28	25	2.6	0.80	0.6	-	1,900,000
GM-0-6 (July 9 & Sept.30)	Storm sewer at Parent Ave., north side Gr. Marais Dr.	160	60	43	11	12.5	2,000,000	510,000,000
		160	35	32	18	20	-	50,000,000
GM-0-7 (Sept.30/71) (July 9/71)	Devon Industrial Park Parent-Grand Marais Pumping Station South side Gr. Marais 400' west of Langlois Ave.	160	45	39	1.0	0.7	-	36,000,000
		260	30	46	2.3	2.5	-	-
GM-0-8	Storm sewer at Remington Ave., north side Gr. Marais Dr.	120	35	29	12	12	-	30,000,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: IV A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
GM-O-9	Roadside ditch at E.C. Row, eastside Gr. Marais Dr.	Ditch Width 5'	Free flowing	30-50 gpm	Relative clear; rapid flowing; some algae growth	Ch/Ba	Sept.30/71 3.50 PM	Sunny Dry
GM-O-10	Storm sewer, northwest of Devonshire Mall	36"	Free flowing outfall	30-50 gpm	Clear; warm; smell of Javex	Ch/Ba	4.00 PM	"
-	Storm sewers at Howard Avenue	-	-	-	Inaccessible	-	-	"
GM-5	Gr. Marais Drain at South Cameron Blvd.	-	-	-	-	Ch/Ba	4.25 PM	"
GM-O-11	Storm sewer 400' west of South Cameron Blvd., southside Gr. Marais Drain	54"	Free flowing outfall	2" depth (20 gpm)	Quite clear No deposits	Ch/Ba	4.35 PM	"
GM-O-12	Field tile 30' east of Dougall Ave.	8"	Free flowing outfall	¼" depth (4 gpm)	Clear	Ch/Ba	Sept.8/71 6.50 PM	Dry; warm; humid
GM-6	Gr. Marais Drain 20' east of Dougall Avenue	-	-	-	-	Ch/Ba	6.15 PM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: IV B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
GM-0-9	Roadside ditch at E.C. Row, east side Gr. Marais Dr.	4.6	20	1.1	3.0	< 0.5	-	220,000
GM-0-10	Storm sewer north-west of Devonshire Mall	< 0.5	5	0.13	0.11	< 0.5	-	< 4
-	Storm sewers at Howard Avenue	-	-	-	-	-	-	-
GM-5	Gr. Marais Dr. at South Cameron Blvd.	19	20	4.0	1.2	< 0.5	-	2,300,000
GM-0-11	Storm sewer, 400' west of South Cameron Blvd., southside Gr. Marais Drain	7.5	5	5.4	2.2	< 0.5	-	100,000
GM-0-12	Field tile 30' east of Dougall Ave.	1.6	3	0.81	0.10	< 0.5	110	1,500
GM-6	Gr. Marais Drain, 20' east of Dougall Ave.	24	25	8.0	2.0	1.2	300,000	960,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: V A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
GM-O-13	Storm sewer at east side Dougall Avenue, south side Gr. Marais	36"	Free flowing outfall	30-50 gpm	Smell of sanitary sewage; black deposits	Ch/Ba Photo #7	Sept.8/71 6.20 PM	Dry Warm Humid
GM-O-14	Storm sewer at west side Dougall Avenue, southside Gr. Marais	12"	Free flowing outfall	½" depth at 0.36%	Smell of sanitary sewage; black deposits	Ch/Ba Photo #8	6.40 PM	"
-	Storm sewer at east side Dougall Avenue, north side Gr. Marais Drain	12"	Free flowing outfall	(½ gpm)	Inaccessible	-	7.00 PM	"
-	Storm sewer at west side Dougall Ave., north side Gr. Marais Drain	15"	Free flowing outfall	¼" depth at 0.47%	Inaccessible	-	7.00 PM	"
GM-O-15	Storm sewer at Church Street, south side Gr. Marais Drain	24"	Free flowing outfall	3/4" depth at 0.59%	Smell of sanitary sewage; black deposits	Ch/Ba	7.15 PM	"
-	Storm sewer east side Bruce Ave., south side Gr. Marais Drain	15"	Free flowing outfall	1/8" depth at 0.24%	Smell of sanitary sewage; black deposits	-	7.30 PM	"
GM-O-16	Storm sewer opposite Bruce Ave., north side Gr. Marais Drain	72"	partly submerged outfall	5½" depth	Smell of sanitary sewage	Ch/Ba	8.00 PM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: V B

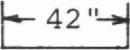
GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
GM-0-13	Storm sewer at east side Dougall Ave., south side Gr.Marais	28	20	13	3.5	5.5	270,000	890,000
GM-0-14	Storm sewer at west side Dougall Ave., south side Gr.Marais Drain	34	10	3.6	1.2	1.0	250,000	870,000
-	Storm sewer at east side Dougall Ave., north side Gr.Marais Drain	-	-	-	-	-	-	-
-	Storm sewer at west side Dougall Ave., north side Gr.Marais	-	-	-	-	-	-	-
GM-0-15	Storm sewer at Church St., south side Gr.Marais Drain	180	25	34	11	7.0	1,460,000	8,900,000
-	Storm sewer, east side of Bruce Ave., south side Gr.Marais Drain	-	-	-	-	-	-	-
GM-0-16	Storm sewer opposite Bruce Ave., north side Gr. Marais Dr.	9.0	50	6.0	2.5	<0.5	59,000	260,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: VI A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
-	Storm sewer opposite Bruce Ave., north side Gr. Marais Drain	12"	Free flowing outfall	Trickle	Smell of sanitary sewage	-	<u>Sept.8/71</u>	Dry Warm Humid
GM-O-17	Storm sewer west side of Bruce Ave., south side Gr. Marais Drain	15"	Free flowing outfall	$\frac{1}{4}$ " depth at 0.25%	Smell of sanitary sewage; black deposits	Ch/Ba	7.40 PM	"
GM-O-18	Storm sewer at Avondale Court, south side Gr. Marais Drain	15"	Free flowing outfall	$\frac{1}{2}$ " depth at 0.20%	Smell of sanitary sewage; black deposits	Ch/Ba	8.10 PM	"
-	Storm sewer at Radisson Ave., north side Gr. Marais Dr.	12"	Free flowing outfall	Trickle	Smell of sanitary sewage	-	8.30 PM	"
GM-O-19	Storm sewer at Radisson Ave., south side Gr. Marais Dr.		Partly submerged outfall	4" depth	Smell of sanitary sewage; black deposits	Ch/Ba	8.20 PM	"
GM-7	Gr. Marais Drain at 100' west of Radisson Ave.	-	-	-	-	Ch/Ba	<u>Sept.8/71</u> 8.40 PM <u>Sept.28/71</u> 9.00 AM	Dry Warm Humid Dry Partly cloudy

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: VI B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
-	Storm sewer opposite Bruce Ave., north side Gr.Maraais Dr.	-	-	-	-	-	-	-
GM-0-17	Storm sewer west side of Bruce Ave., south side Gr.Maraais	95	30	34	8.0	5.0	410,000	1,100,000
GM-0-18	Storm sewer at Avondale Court, south side Gr.Maraais	120	40	32	19	22	910,000	14,200,000
-	Storm sewer at Radisson Ave., north side Gr.Maraais Drain	-	-	-	-	-	-	-
GM-0-19	Storm sewer at Radisson Ave., south side Gr. Maraais Dr.	55	20	23	7.5	6.0	330,000	3,200,000
GM-7 (Sept.8/71 (Sept.28/71	Gr. Maraais Drain at 100' west of Radisson Ave.	22 6.5	25 20	8.5 4.0	2.5 1.0	1.3 <0.5	450,000 90,000	4,200,000 190,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET:V11 A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
GM-O-20	Storm sewer at Woodland Ave., south side Gr. Marais Dr.	36"	Partly submerged outfall	16" depth	Smell of sanitary sewage; black deposits	Ch/Ba	Sept.28/71 9.15 AM	Dry Partly cloudy
GM-O-21	Storm sewer at Woodland Ave., north side Gr. Marais Dr.	27"	Partly submerged outfall	23" depth	No visible flow	Ch/Ba	9.30 AM	"
GM-O-22	Storm sewer at Rockwell Ave., south side Gr. Marais Drain	15"	Free flowing outfall	3/8" depth at 1.16%	Foam; smell of sanitary sewage	Ch/Ba	9.50 AM	"
-	Storm sewer opposite Virginia Park Ave., north side Gr. Marais	15"	Free flowing outfall	4 gpm	Outfall overgrown; smell of sanitary sewage; black deposits	-	11.00 AM	"
GM-O-23	Storm sewer opposite Virginia Park Ave., north side Gr. Marais Drain	18"	Free flowing outfall	1/4" depth at 0.43%	Foam; milky white	Ch/Ba	11.00 AM	"
GM-O-24	Storm sewer at Virginia Park Ave., south side Gr. Marais	21"	Partly submerged outfall	6" depth	Smell of sanitary sewage; black deposits	Ch/Ba	10.10 AM	"
-	Storm sewer at Dandurand Ave., south side Gr. Marais Dr.	21"	Partly submerged outfall	15" depth Trickle	Foam	-	10.20 AM	"

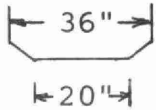
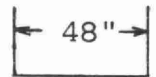
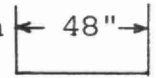
ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET:VII B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
GM-0-20	Storm sewer at Woodland Ave., south side Gr. Marais Dr.	24	15	19	3.5	<0.5	800,000	1,400,000
GM-0-21	Storm sewer at Woodland Ave., north side Gr. Marais Dr.	3.8	5	22	3.2	<0.5	13,000,000	170,000,000
GM-0-22	Storm sewer at Rockwell Ave., south side Gr. Marais Drain	48	25	16	2.5	2.4	165,000	170,000
-	Storm sewer opposite Virginia Park Ave., north side Gr. Marais	-	-	-	-	-	-	-
GM-0-23	Storm sewer opposite Virginia Park Ave., north side Gr. Marais	750	210	36	6.5	38	5,600	80,000
GM-0-24	Storm sewer at Virginia Park Ave., south side Gr. Marais	42	15	38	5.0	1.6	250,000	1,300,000
-	Storm sewer at Dandurand Ave., south side Gr. Marais Drain	-	-	-	-	-	-	-

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
GM-O-25	Storm sewer at Academy Drive, south side Gr. Marais Dr.	24"	Free flowing outfall	1-3/4" depth at 0.24%	Smell of sanitary sewage; black deposits; foam	Ch/Ba	Sept.28/71 10.30 AM	Dry Partly cloudy
GM-O-26	Storm sewer at Academy Drive, north side Gr. Marais Dr.		Free flowing outfall	1/4" depth	Smell of sanitary sewage; black deposits; murky	Ch/Ba	10.45 AM	"
GM-O-27	Storm sewer at Morris Drive, south side Gr. Marais Dr.	20"	Free flowing outfall	1 1/4" depth at 0.02%	Foam; smell of sanitary sewage; black deposits	Ch/Ba	11.30 AM	"
GM-8	Gr. Marais Drain, 10' east Longfellow Ave.	-	-	-	-	Ch/Ba	12.00 AM	"
GM-O-28	Storm sewer at Longfellow Ave., south side Gr. Marais		Partly submerged outfall	6" depth	Smell of sanitary sewage; black deposits; grit deposits in sewer outlet (west side)	Ch/Ba	11.45 AM	"
GM-O-29	Storm sewer at Longfellow Ave., north side Gr. Marais Dr.		Partly submerged outfall	6 1/2" depth	Smell of sanitary sewage; black deposits; grit deposits in sewer outlet (east side)	Ch/Ba	11.55 AM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET:VIIIB

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
GM-0-25	Storm sewer at Academy Drive, south side Gr. Marais Dr.	17	5	20	4.2	<0.5	110,000	110,000
GM-0-26	Storm sewer at Academy Drive, north side Gr. Marais Dr.	26	15	26	9.0	<0.5	1,200,000	32,000,000
GM-0-27	Storm sewer at Morris Drive, south side Gr. Marais Dr.	90	20	31	21	11	160,000	210,000
GM-8	Gr. Marais Drain, 10' east of Longfellow Avenue	9.5	10	5.2	1.4	<0.5	150,000	170,000
GM-0-28	Storm sewer at Longfellow Ave., south side Gr. Marais	26	5	29	7.8	3.0	146,000	160,000
GM-0-29	Storm sewer at Longfellow Ave., north side Gr. Marais Drain	10	10	19	5.4	<0.5	130,000	150,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: IX A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
GM-0-30	Asb. Cement pipe 150' west of Long-fellow Ave., north side Gr. Marais Dr.	6"	Free flowing outfall	5 gpm	Clear; no foam	Ch/Ba	Sept.28/71 12.15 PM	Dry Partly cloudy
GM-0-31	Storm sewer at Dominion Blvd., south side Gr. Marais Dr.	27"	Partly submerged outfall	5" depth; visually fair amount of flow	Smell of sanitary sewage; black deposits	Ch/Ba	12.30 PM	"
GM-0-32	Storm sewer at Dominion Blvd., north side Gr. Marais Dr.	36"	Free flowing outfall	½" depth at 0.01%	Light foaming; smell of sanitary sewage	Ch/Ba	12.45 PM	"
-	Storm sewer at McKay Avenue, north side Gr. Marais Dr.	27"	Totally submerged outfall	No indication of flow	No specific smell	-	1.00 PM	"
GM-0-33	Storm sewer at McKay Ave., south side Gr. Marais Dr.	33"	Partly submerged outfall	4" depth	Smell of sanitary sewers; black deposits	Ch/Ba	1.00 PM	"
GM-9	Gr. Marais Drain 100' east of Curry Ave.	-	-	-	-	Ch/Ba	Sept.29/71 2.10 PM	Dry Sunny

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: IX B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
GM-0-30	Asb. Cement pipe, 150' west of Long-fellow Ave., north side Gr. Marais Dr.	2.0	5	2.0	0.20	< 0.5	12,500	16,000
GM-0-31	Storm sewer at Dominion Blvd., south side Gr. Marais Dr.	75	25	22	9.5	13	31,000,000	250,000,000
GM-0-32	Storm sewer at Dominion Blvd., north side Gr. Marais Dr.	20	25	14	5.5	2.2	23,000	36,000
-	Storm sewer at McKay Ave., north side Gr. Marais Dr.	-	-	-	-	-	-	-
GM-0-33	Storm sewer at McKay Ave., south side Gr. Marais Dr.	75	30	32	15	10	110,000,000	140,000,000
GM-9	Gr. Marais Drain 100' east of Curry Ave.	32	10	6.8	2.2	< 0.5	80,000	80,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: X A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
GM-0-34	Yorktown Plaza S.T.P. outfall 30' east of Curry Ave., north side Gr. Marais	8"	Free flowing outfall	5 gpm	Clear	Ch/Ba	Sept. 29/71 2.15 PM	Dry Sunny
GM-0-35	Storm sewer at Curry Ave., north side Gr. Marais Dr.	38"	Free flowing outfall	¼" depth at 0.29%	Smell of sanitary sewage; murky; black deposits	Ch/Ba	2.30 PM	"
-	Storm sewer at Curry Ave., south side Gr. Marais Dr.	36"	Free flowing outfall	1/8" depth	Smell of sanitary sewage	-	2.40 PM	"
GM-0-36	Storm sewer at Everts Ave., south side Gr. Marais Dr.	54"	Partly submerged outfall	12" depth, visually little flow	No smell; quite clear	Ch/Ba	2.50 PM	"
-	Storm sewer at Everts Ave., north side Gr. Marais Dr.	24"	Partly submerged outfall	16" depth, visually little flow	Appeared to reflect Gr. Marais conditions	-	2.50 PM	"
GM-0-37	Mark Ave. Treatment Plant outfall 200' east of Glenwood Ave., south side Gr. Marais	12"	Free flowing outfall	2" depth 450,000 gpd	Extensive foaming, clear with floating particles	Ch/Ba	3.05 PM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: X B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
GM-0-34	Yorktown Plaza STP outfall, 30' east of Curry Ave., north side Gr. Marais Dr.	4.2	5	0.62	1.0	< 0.5	230	3,300
GM-0-35	Storm sewer at Curry Ave., north side Gr. Marais Dr.	12	10	12	5.2	< 0.5	200,000	190,000
-	Storm sewer at Curry Ave., south side Gr. Marais Dr.	-	-	-	-	-	-	-
GM-0-36	Storm sewer at Everts Ave., south side Gr. Marais Dr.	28	10	6.0	2.0	< 0.5	240,000	300,000
-	Storm sewer at Everts Ave., north side Gr. Marais Dr.	-	-	-	-	-	-	-
GM-0-37	Mark Ave. Treatment Plant outfall; 200' east of Glenwood Ave., south side Gr. Marais Drain	75	35	39	9.0	5.5	1,600	400,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: XI A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
-	Storm sewer 150' east of Glenwood Ave., north side Gr. Marais	24"	Partly submerged outfall	4" depth, visual trickle	Black deposits, smell of sanitary sewage	-	Sept. 29/71 3.15 PM	Dry Sunny
-	Storm sewer just east of Bridge at Glenwood Ave., north side Gr. Marais Dr.	12"	Free flowing outfall	Trickle	Smell of sanitary sewage; sewage fungus	-	2.10 PM	"
GM-0-38	Storm sewer just east of Bridge at Glenwood Ave., south side Gr. Marais Dr.	15"	Free flowing outfall	<1/8 gpm	Smell of sanitary sewage; sewage fungus	Ch/Ba	3.30 PM	"
-	Storm sewer just west of Bridge at Glenwood Ave., north side Gr. Marais Dr.	12"	Partly submerged outfall	Visually very little flow	Clear	-	3.35 PM	"
-	Storm sewer 50' west of Glenwood Ave., south side Gr. Marais	8"	Free flowing outfall	Dripping	-	-	3.35 PM	"
GM-0-39	Storm sewer at Massey Court, south side Gr. Marais Dr.	15"	Free flowing outfall	1/8 gpm	Clear; no smell; no deposits	Ch/Ba	3.45 PM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: XI B

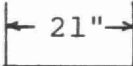
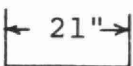
GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
-	Storm sewer 150' east of Glenwood Ave., north side Gr. Marais Drain	-	-	-	-	-	-	-
-	Storm sewer just east of Bridge at Glenwood Ave., north side Gr. Marais Drain	-	-	-	-	-	-	-
GM-0-38	Storm sewer just east of bridge at Glenwood Ave., south side Gr. Marais Dr.	85	10	34	7.5	1.8	76,000	76,000
-	Storm sewer just west of bridge at Glenwood Ave., north side Gr. Marais Dr.	-	-	-	-	-	-	-
-	Storm sewer 50' west of Glenwood Ave., south side Gr. Marais Drain	-	-	-	-	-	-	-
GM-0-39	Storm sewer at Massey Court, south side Gr. Marais Dr.	4.0	10	0.44	0.13	< 0.5	22,000	90,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET:XII A

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
-	Storm sewer 250' east of Rankin Ave., north side Gr.Maraais	54"	Partly submerged outfall	10" depth; visually no flow	Clear	-	Sept.29/71 4.05 PM	Dry Sunny
-	Storm sewer 250' east of Rankin Ave., south side Gr.Maraais	27"	-	Visually very little flow	Fairly clear	-	4.10 PM	"
GM-10	Gr. Maraais Drain 30' east of Rankin Ave.	-	-	-	-	Ch/Ba	4.25 PM	"
-	Storm sewer at Rankin Ave., north side Gr. Maraais Dr.		Free flowing outfall	None	Base wet	-	5:30 PM	"
GM-0-40	Storm sewer at Rankin Ave., south side Gr. Maraais Dr.		Free flowing outfall	1/4 gpm	Smell of sanitary sewage; murky	Ch/Ba	5.40 PM	"
-	Storm sewer at Randolph Ave., south side Gr. Maraais Dr.	21"	Free flowing outfall	1 gpm	Smell of sanitary sewage; from section of sewer pipe broken off	- Photo #9	5.50 PM	"
GM-0-41	Storm sewer at Randolph Ave., north side Gr. Maraais Dr.	38"	Free flowing outfall	1" depth at 0.23%	Smell of sanitary sewage; murky	Ch/Ba Photo #9	6.00 PM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: XIIB

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
-	Storm sewer 250' east of Rankin Ave., north side Gr.Marais	-	-	-	-	-	-	-
-	Storm sewer 250' east of Rankin Ave., south side Gr.Marais	-	-	-	-	-	-	-
GM-10	Gr. Marais Drain 30' east of Rankin Ave.	30	10	7.0	2.5	<0.5	120,000	140,000
-	Storm sewer at Rankin Ave., north side Gr.Marais Dr.	-	-	-	-	-	-	-
GM-0-40	Storm sewer at Rankin Ave., south side Gr. Marais Dr.	44	10	19	6.5	5.0	-	8,000,000
-	Storm sewer at Randolph Ave., south side Gr.Marais Drain	-	-	-	-	-	-	-
GM-0-41	Storm sewer at Randolph Ave., north side Gr.Marais Drain	140	40	28	14	16	-	7,600,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET:XIIIA

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
-	Storm sewer at St. Patricks Ave., north side Gr.Maraais	27"	Partly submerged outfall	4" depth; No visible flow	Clear	-	Sept.29/71 6.15 PM	Dry Sunny
GM-0-42	Storm sewer at St. Patricks Ave., south side Gr. Maraais	30"	Partly submerged outfall	2" depth; visually little flow	Clear	Ch/Ba	6.20 PM	"
GM-0-43	Storm sewer at Askin Ave., north side Gr. Maraais Dr.	24"	Free flowing outfall	1" depth (5 gpm)	Smell of sanitary sewage; murky; front section of sewer pipe broken	Ch/Ba	6.45 PM	"
GM-0-44	Storm sewer at Askin Ave., south side Gr. Maraais Dr.	30"	Free flowing outfall	¼ gpm	Clear	Ch/Ba	7.10 PM	"
-	Storm sewer at California Ave., north side Gr.Maraais	12"	Free flowing outfall	Dry	-	-	7.15 PM	"
GM-0-45	Storm sewer at California Ave., south side Gr.Maraais	15"	Free flowing outfall	¼" depth at 0.39% (2 gpm)	Smell of sanitary sewage; murky	Ch/Ba	7.25 PM	"
-	Storm sewer 275' west of California Ave., north side Gr. Maraais Drain	21"	Free flowing outfall	Dripping	-	-	7.45 PM	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: XIII B

GRAND MARAIS DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
-	Storm sewer at St. Patricks Ave., north side Gr. Marais	-	-	-	-	-	-	-
GM-0-42	Storm sewer at St. Patricks Ave., south side Gr. Marais	2.0	10	0.42	0.13	< 0.5	-	20,000
GM-0-43	Storm sewer at Askin Ave., north side Gr. Marais Dr.	120	30	32	12	12	-	10,000,000
GM-0-44	Storm sewer at Askin Ave., south side Gr. Marais Dr.	1.8	10	0.30	0.42	< 0.5	-	17,000
-	Storm sewer at California Ave., north side Gr. Marais Dr.	-	-	-	-	-	-	-
GM-0-45	Storm sewer at California Ave., south side Gr. Marais	280	75	31	24	22	-	23,000,000
-	Storm sewer 275' west of California Ave., north side Gr. Marais Drain	-	-	-	-	-	-	-

FIELD OBSERVATIONS

WATER POLLUTION SURVEY

SHEET: XIV A

GRAND MARAIS DRAIN

CITY OF WINDSOR

[illegible]

ANALYSES RESULTS

WATER POLLUTION SURVEY

SHEET: XIV B

GRAND MARAIS DRAIN

CITY OF WINDSOR

[illegible]

APPENDIX III

CITY OF WINDSOR

WATER POLLUTION SURVEY

LENNON DRAIN

SURVEY RESULTS

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: I A

LENNON DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
LD-1	Lennon Drain, 150' west of Ronald Ave.	-	-	1½" depth (20 gpm)	Covered 60" - drain becomes open watercourse, smell of sanitary sewage; murky	Ch/Ba	<u>Oct.1/71</u> 8.15 am	Dry; Partly cloudy
-	Ditch at 150' west of Ronald Ave., north side Lennon Drain	-	Free flowing	Dry	-	-	8.10 am	"
-	Storm sewer east side of Dougall Ave., north side Lennon Drain	30"	Partly submerged outfall	No visible indication of flow	-	-	8.30 am	"
-	Storm sewer west side of Dougall Ave., south side Lennon Drain	24"	Partly submerged outfall	1/4 gpm	Smell sanitary sewage	-	8.30 am	"
LD-2	Lennon Drain at Casgrain Dr., just east of bridge	-	-	-	Clear, some algae growth	Ba Photo #1	9.00 am	"
LD-0-1	Storm sewer at Casgrain Dr., south side Lennon Drain	36"	Partly submerged outfall	18" depth substantial flow	Smell sanitary sewage; black deposits	Ch/Ba	8.50 am	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: I B

LENNON DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
LD-1	Lennon Drain, 150' west of Ronald Ave.	10.	5	22.	7.0	2.9	40,000	17,000,000
-	Ditch at 150' west of Ronald Ave., north side Lennon Drain	-	-	-	-	-	-	-
-	Storm sewer east side of Dougall Ave., north side Lennon Drain	-	-	-	-	-	-	-
-	Storm sewer west side of Dougall Ave., south side Lennon Drain	-	-	-	-	-	-	-
LD-2	Lennon Drain at Casgrain Dr., just east of bridge	-	-	-	-	-	37,000	9,200,000
LD-0-1	Storm sewer at Casgrain Dr., south side Lennon Drain	65.	20	38.	9.7	1.1	320,000	17,000,000

FIELD OBSERVATIONSWATER POLLUTION SURVEY

SHEET: II A

LENNON DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	Size of Outfall (Inches)	Kind of Outfall	Estimated Flow	Observations	Action	Day and Time of Sampling	Weather during Survey
LD-3	Lennon Drain at Casgrain Dr., just west of bridge	-	-	-	Excessive growth of sewage fungi	Ba Photo #2	<u>Oct.1/71</u> 9.20 am	Dry, Partly cloudy
LD-0-2	Storm sewer 200' west of Casgrain Dr. north side Lennon Dr.	18"	Partly submerged outfall	2" depth (2 gpm)	Smell of sanitary sewage; black deposits	Ba	9.25 am	"
-	Storm sewer at Longfellow Ave., south side Lennon Drain	24"	Partly submerged outfall	No observation possible	Inaccessible	-	9.30 am	"
-	Storm sewer at Mount Royal Blvd., south side Lennon Dr.	24"	Partly submerged outfall	No indication of flow	Inaccessible	-	9.35 am	"
-	Storm sewer at Mount Royal Blvd., north side Lennon Dr.	18"	Partly submerged outfall	No indication of flow	Inaccessible	-	9.35 am	"
-	Storm sewer at Carmel Dr., south side Lennon Drain	42"	Partly submerged outfall	No indication of flow	Clear	-	9.40 am	"

ANALYSES RESULTSWATER POLLUTION SURVEY

SHEET: II B

LENNON DRAINCITY OF WINDSOR

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as ABS	Faecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.
LD-3	Lennon Drain at Casgrain Dr., just west of bridge	-	-	-	-	-	> 1,500	2,700,000
LD-0-2	Storm sewer 200' west of Casgrain Dr. north side Lennon Dr.	-	-	-	-	-	1,930,000	39,000,000
-	Storm sewer at Longfellow Ave., south side Lennon Drain	-	-	-	-	-	-	-
-	Storm sewer at Mount Royal Blvd., south side Lennon Dr.	-	-	-	-	-	-	-
-	Storm sewer at Mount Royal Blvd., north side Lennon Dr.	-	-	-	-	-	-	-
-	Storm sewer at Carmel Dr., south side Lennon Drain	-	-	-	-	-	-	-

FIELD OBSERVATIONS

WATER POLLUTION SURVEY

SHEET: IIIA

LENNON DRAIN

CITY OF WINDSOR

[illegible]

ANALYSES RESULTS

WATER POLLUTION SURVEY

SHEET: III B

LENNON DRAIN

CITY OF WINDSOR

[illegible]

APPENDIX IV

GRAND MARAIS DRAIN

PICTORIAL SURVEY

September 1971

KEY PLAN

1" = 500'

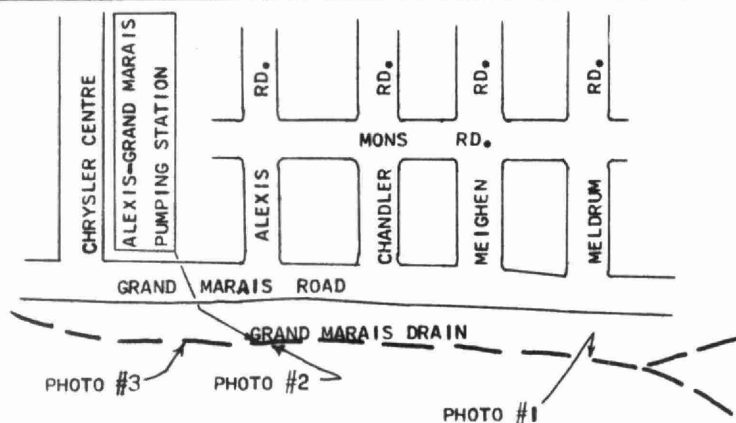


PHOTO No. 1
(viewed westwards)

Grand Marais Drain at Meldrum Road, 800 ft. east of Alexis-Grand Marais Pumping Station. Upstream of any domestic or industrial waste input.

PHOTO No. 2

Alexis-Grand Marais Pumping
Station. First domestic
wastes input into the
Grand Marais Drain (GM-0-1).
Dry weather flow: 200,000 gpd
(estimated).

<u>BOD₅</u> <u>(ppm)</u>	<u>Susp.</u> <u>Solids</u> <u>(ppm)</u>	<u>MF Coliform</u> <u>Count per 100 ml</u>
34	15	6,000,000

PHOTO No. 3
(viewed eastwards)

Grand Marais Drain 150 ft.
west of Alexis-Grand Marais
Pumping Station. Downstream
of the first domestic wastes
input - water highly con-
taminated (GM-1).

<u>BOD₅</u> <u>(ppm)</u>	<u>Susp.</u> <u>Solids</u> <u>(ppm)</u>	<u>MF Coliform</u> <u>Count per 100 ml</u>
28	15	2,500,000

KEY PLAN

Scale: 1" = 500'

SANITARY SEWERS - - - - -

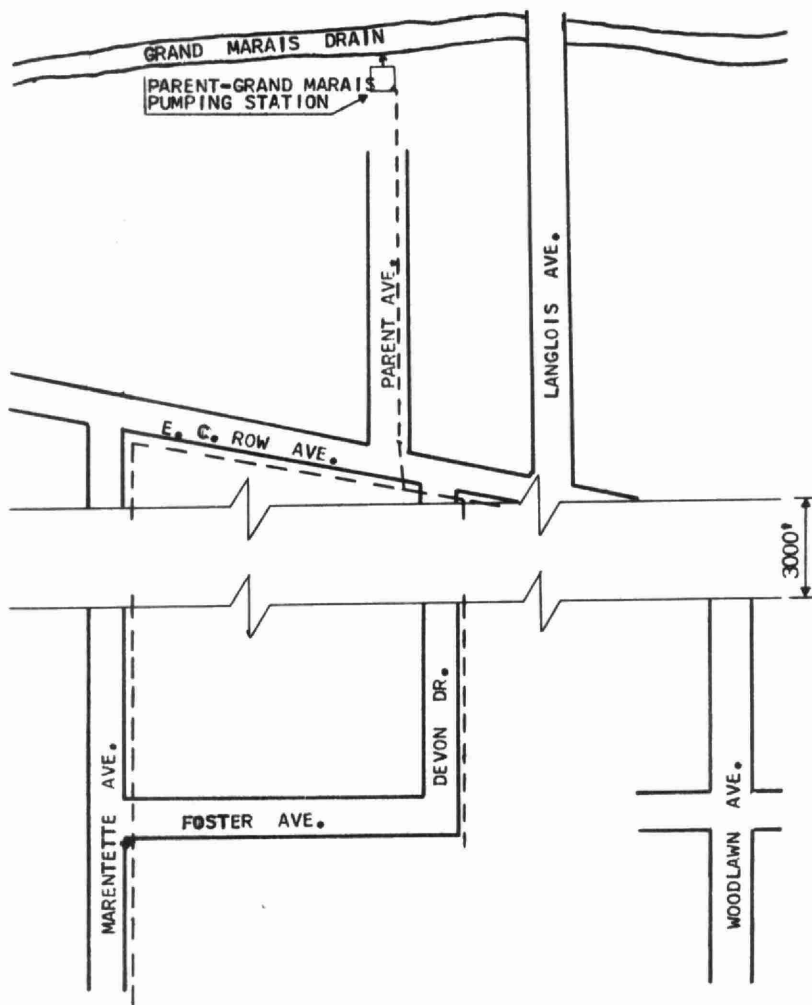


PHOTO No. 4 (viewed eastwards)
Parent-Grand Marais Pumping Station outfall (GM-0-7)
Estimated Flow: 15,000 gpd
Waste input from Devon Industrial Park.

PHOTO No. 5

Parent-Grand Marais Pumping Stn.
domestic-industrial wastes.

Pump Cycle: Sept. 30, 1971

On: 2.21 PM)

Off: 2.22 PM) light green

On: 2.38 PM)

Off: 2.39 PM) pink, hot

PHOTO No. 6

Parent-Grand Marais Pumping Stn.
Extensive foaming:

<u>BOD₅</u>	<u>Susp. Solids</u>	<u>MF Coliform Count per 100 ml</u>
(ppm)	(ppm)	
160	45	36,000,000

PHOTO No. 7 (GM-0-13)

36" storm-sewer outfall at Dougall Avenue
Estimated Flow: 30-50 gpm of inadequately-
treated domestic waste.

PHOTO No. 8 (GM-0-14 & GM-0-13)

Two storm-sewer outfalls at Dougall Ave., conveying
domestic wastes into the Grand Marais Drain.

PHOTO No. 9 (GM-0-41)

In foreground the Randolph Ave. storm-sewer outfall conveying murky sanitary wastes into Grand Marais Drain.

Analyses Results:

	Susp.	
BOD ₅	Solids	MF Coliform
(ppm)	(ppm)	Count per 100 ml
140	40	7,600,000

APPENDIX V

LENNON DRAIN

PICTORIAL SURVEY

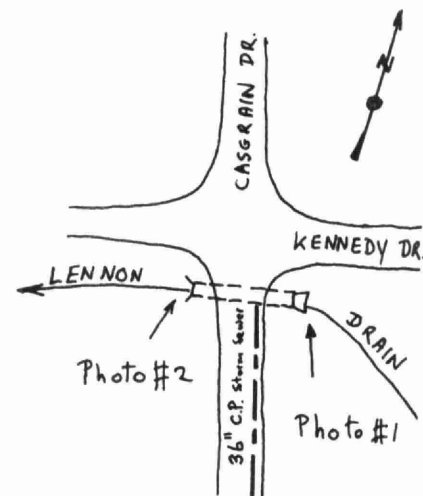
October 1971

Flow
direction
↓

KEY PLAN:
1" = 100'

PHOTO No. 1 (LD-2)

Lennon Drain just east of bridge at Casgrain Dr.
Note that the above and below stations of the
Lennon Drain are only 50 ft. apart.



Flow
direction
↑

PHOTO No. 2 (LD-3)

Lennon Drain just west of bridge at Casgrain Dr.
Notice the sewage fungi due to domestic wastes
input through Casgrain Dr. storm sewer.

Date Due

ONTARIO

O.W.R.C.

Water Pollution Survey (Grand Marai
Drain and Lennon Drain)

City of Windsor, County of Essex
Brink, C.W. 1971

TERMINAL STREAM: DETROIT R.

DATE

ISSUED TO

PRINTED IN CANADA

